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United States Department of Agriculture
Agricultural Research Administration
Bureau of Agricultural and Industrial Chemistry
Washington 25, D.C.

May 3, 1948

Memorandum to: Louis B. Howard, Chief of Bureau, AIC

From: P. H. Groggins, AIC

Subject: PROPOSED MOBILE POTATO DEHYDRATION TRAIN

At a meeting held in Room 104A on April 15, 1948, Mr. F. W. Boltz of the Boltz Corporation of Los Angeles, Calif., described a mobile potato dehydration train to members of the Department—including representatives of the Secretary's office; personnel of the Fruit and Vegetable Branch, PMA; and representatives of the Quartermaster General. ARA was represented by Messrs. Rhett Winters, R. K. Eskew, and P. H. Groggins.

The demonstration or, rather, exposition stemmed from the interest of the Quartermaster Corps in obtaining for relief feeding approximately 56 million pounds of dehydrated soup containing about 20% potato solids. The Potato Division, PMA, has long been encouraging the development of a practical mobile dehydration unit for economic reasons. In general it costs PMA about as much for freight as it receives from "diversion potatoes." Considering the millions of bushels that PMA has to acquire pursuant to law, one can readily understand its interest in stabilizing potatoes at or near the points of production.

The proposal of Mr. Boltz is not novel. The drying procedure is similar to that employed by the E. H. Beer Company of Baltimore. Briefly the steps would be, washing and hand grading of potatoes; spraying of unpeeled, washed potatoes with a solution of sulfur dioxide; slicing of potatoes; dewatering of slices or chips in a continuous P & L rotary press; delivery of product to an oil-heated, direct fired rotary dryer. The dried product would then be cooled, ground, sieved and bagged.

To carry out the aforementioned operations, Mr. Boltz proposes to use a 9-car mobile train. Two cars would carry the washing, inspection and sulfiting equipment. The slicing machine and press would be mounted on car 3. The dryer, 70 ft. long and 7 ft. in diameter, would be mounted on cars 4 and 5. The dryer would be built in two sections with the junction about center to provide necessary flexibility in transit. The final processing would be carried out on car 6 and appurtenances thereto. Three additional cars would be provided for sleeping quarters, dining facilities, repair shops, etc. Mr. Boltz estimated that the cost of the first complete unit would be about \$350,000, and \$200,000 for subsequent units. He proposed that the Department of the Army and the Department of Agriculture each invest one-third, while the F. W. Boltz Corporation would contribute the remainder. Through repayments to the governmental agencies from profits, final ownership would reside with the operator.

Observations

The Product. Because there would be no peeling operations, and direct heat at relatively high temperatures would be used, the product would not be as

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attractive or as uniform as the potato flour now being produced in many sections of the country. The price to be paid Boltz would, however, be the same.

The Process. The proposed operating technic envisions the use of a P & L press. Mr. Boltz indicated that this would give rise to a loss of about 9% of potato solids. According to reports from ERRL and the experience of the E. H. Beer Company, the loss by pressing would be closer to 15 percent. Aside from the inefficiency of potato utilization, the use of a press introduces a serious disposal problem. One can readily imagine the impact on a countryside when about 5 to 15 carloads of potato fluids are dumped daily into country ditches.

Under no circumstances could the writer recommend Departmental support for such a process or participation in such a project. It could readily be a source of litigation.

Productivity of Mobile Unit. Mr. Boltz stated that the estimated drying capacity of the 70 ft. long by 7 ft. dia. dryer operating at 800°C inlet and 90°C stack temperatures would be about 150 tons per day. (Equivalent to product from > 900 tons or 30 carloads of potatoes.) The Beaird dryers, 30 ft. long and 4 ft. dia., show an output of 4 to 5 tons per machine for comparable operations. Based on equivalence of output per cu. ft. of drying area, one would anticipate an output of about 35-40 tons daily (equal of 8 Beaird dryers). Granting the increased efficiency in a longer dryer and making allowances for the use of higher temperatures, it is believed that Mr. Boltz is somewhat optimistic in estimating the productivity of his dryer. The difference between 40 tons and 150 tons is too great to accept without a challenge.

Some Technological Considerations. It is to be emphasized that the proposal of Mr. Boltz has no demonstrated record of satisfactory performance. It is not known whether the potato slices or chips will adhere to the drum surface and cause darkening of product. It is known that dewatering results in a serious loss of contained potato proteins, salts and vitamins.

It is questionable whether the elaborate 9-car train is necessary--particularly if engineer, fireman, conductor, etc., are to be carried along as nonproductive deadheads.

Some Economic Considerations. In all probability the Department would deliver surplus potatoes to Mr. Boltz at 30 to 35 cents per hundredweight. This price has been paid by potato flour manufacturers for culls and surpluses for many years. Potato flour has been obtainable for $5\frac{1}{2}$ to $6\frac{1}{2}$ cents in packages when potatoes were available in the indicated cost range. There is no doubt that Boltz could produce a dehydrated product (not flour) under such circumstances and market it profitably at 7 cents per pound. Assuming a relatively high reduction ratio, potatoes to product of 7:1, it would then require 700 pounds of potatoes per 100 pounds of product. At 35 cents per hundredweight, the cost of potatoes per 100 pounds of product would be \$2.45. Roughly, the cost of production per pound of dehydrated product would be as follows:

Potatoes	2.4	cents	
Fuel and Power	.8	"	
All labor	1.5	"	
Overhead	.5	"	
Depreciation	.2	"	
	5.4	"	No advertising, selling, or storing expenses.

Assuming a production of 50 tons (instead of 150) per day for 200 days, an annual output of 20 million pounds can be envisioned. With a margin of 1.6 cents between factory cost and factory selling price, there is the prospect of clearing \$320,000. With a 1-cent differential, the potential clearings would be \$200,000. If half this amount were set aside for amortization, it would permit Boltz or any potato flour manufacturer to write off his investment in a short time. The point to be emphasized is--under the favorable conditions now prevailing, there appears to be no need for Government financing. If Boltz has a good, workable project, he should not find it necessary to enlist governmental aid--other than delivery of surplus potatoes.

Counterproposals. The need for intensifying research on the development of a mobile potato dehydrator is recognized. Any acceptable design would have to be based on proven stationary practice. No process involving a disposal problem would be acceptable. The following three schemes appear worthy of preliminary exploration by research staffs:

- (1) German process: using direct heat in a rotary dryer, the potato slices being dusted with potato flour prior to entrance in the heated zone.
- (2) Process of recycling from 40% to 60% of dried product as a bed for moist potato chips or mash.
- (3) Use of drum dryers heated by Dowtherm or similar heat-transfer fluid.

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